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09/909,592	07/20/2001	William Downs	6152	3298

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McDermott Incorporated, Patent Department
Alliance Research Center
1562 Beeson Street
Alliance, OH 44601-2196

EXAMINER

LEUNG, JENNIFER A

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 04/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/909,592

Applicant(s)

DOWNS ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Applicant's amendment submitted on January 16, 2004 has been received and carefully considered. The changes made to the specification are acceptable. Claims 1-20 have been cancelled. Claims 21-36 have been added.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 21, 22 and 25-27 are rejected under 35 U.S.C. 102(e) as being anticipated by Rau et al. (US 2001/0022952).

Regarding claims 21 and 22, Rau et al. (see FIG. 1) disclose a system comprising:
a water intake (i.e., water **136a** and/or **136b**) connected to at least one intake channel which inherently slopes downwardly away from the water intake (i.e., "Water may be added to, and the solution effluent removed from, the reactor by pump, *gravity feed*, or other means well known in the art for liquid handling," section [0080]);
at least one drainage channel (i.e., bleed line **142b** for mixture **142**);
at least one reaction bed containing buffering agent (i.e., reactor vessel **100** containing carbonate **152**, such as limestone; section [0075]), positioned between one inlet channel and one drainage channel, having an inlet fluidically connected to the one intake channel and an

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outlet fluidically connected to the one drainage channel, wherein the inlet may be positioned vertically beneath the outlet (i.e., “For purposes of allowing carbonate particles to settle and for minimizing particulate load in the recirculated/removed waste solution, *it would be advantageous to maintain the solution level and hence the solution outlet or outlets above the carbonate bed/pile level,*” section [0081]. Furthermore, “Aqueous solution **132** may also be introduced directly into the *lower region* of the reactor vessel **100** as shown,” section [0084], and “Flow may be vertically upward,” section [0099]);

at least one fluid gas manifold at least partially submerged within the reaction bed (i.e., CO₂ gas stream **112b, 112c**; section [0084]), said manifold connected to a fluid gas exhaust of a power plant (section [0021]) and said manifold inherently having a series of outlet perforations positioned to emit fluid gas into the reaction bed (i.e., “CO₂ in a gas stream may be hydrated... by passing the gas stream through an aqueous solution whose surface area is enhanced preferably by *spraying or atomizing, by bubbling the gas stream* into an aqueous solution, and/or by passing the gas stream over or through wetted carbonate,” section [0072]); and

wherein the drainage channels are positioned relative to the intake channels so as to induce water flow through the reaction bed (sections [0080], [0081]).

Regarding claim 25, Rau et al. discloses the water intake is selected from the group consisting of a lake, ocean or reservoir (i.e., “Locating the reactor vessels on or near a large body of water (e.g. river, lake, sea or ocean) would be advantageous because it could... provide a ready source of water for the reactor,” section [0126]).

Regarding claims 26 and 27, Rau et al. discloses water flow may be induced by gravitational force (section [0080], lines 1-3).

Instant claims 21, 22 and 25-27 structurally read on the apparatus of Rau et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rau et al. (US 2001/0022952).

Regarding claim 23, although Rau et al. is silent as to water filling the reaction bed to approximately two-thirds in comparison to the limestone contained in the bed, Rau discloses,

“The amount of water added to the reactor per unit time relative to the removal of waste solution effluent from the reactor will determine the solution level within the reactor. In various embodiments reactor solution may be maintained or varied at levels ranging from significantly above to significantly below the top level of the particulate carbonate bed/pile within the reactor.” (section [0081]).

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate water filling level in the reaction bed in the apparatus of Rau et al.,

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as the specific level is not considered to confer patentability to the claim since the precise filling level would have been considered a result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the filling level of water in the system to obtain the desired rate of reaction for carbonic acid formation, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 24, although Rau et al. is silent as to the limestone being granulated to a diameter determined by "a Sauter mean diameter calculation," Rau et al. discloses,

"The particulate carbonate may be of homogeneous or heterogeneous size and shape ranging from very fine particles to large chunks... Because the overall rate of step 2 will be a function of the surface area of the particles exposed to the aqueous solution, the greatest surface area and hence greatest reaction rate per unit volume will be achieved with the smallest sized carbonate particles... The size of such particle might be less than 0.1 mm. At the other extreme would be carbonate particle sizes, e.g. >10 cm whose individual mass would preclude prolonged suspension in air or solution and whose collective mass would then form a static bed, pile or other configuration of carbonate particles," (sections [0073]-[0076]).

Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate diameter for the granulated limestone for the reaction bed in the apparatus of Rau et al., as the specific diameter is not considered to confer patentability to the claim since the precise diameter would have been considered a result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter of the limestone in the system to obtain the desired reaction rate per unit volume of carbonate bed, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980),

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and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

4. Claims 21-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schnur (US 2,719,032) in view of Rau et al. (US 2001/0022952).

Regarding claim 21 and 25-27, Schnur (FIG. 1, 2; column 5, lines 16-23) discloses a system comprising:

a water intake (i.e., a water supply, inherently a reservoir; not shown) connected to at least one intake channel (i.e., supply line 2);

at least one drainage channel (i.e., overflow pipe 3);

at least one reaction bed containing buffering agent, (i.e., container 1, comprising alkaline liquid; column 2, lines 67-72) positioned between inlet channel 2 and drainage channel 3, having an inlet fluidically connected to intake channel 2 and an outlet fluidically connected to drainage channel 3, wherein the inlet is positioned vertically beneath the outlet (FIG. 1);

at least one fluid gas manifold at least partially submerged within the bed and having a series of outlet perforations positioned to emit fluid gas exhaust into the bed (i.e., collecting pipe 5 and perforated blow pipes 6, for bubbling undesirable impurities such as carbon dioxide from technical processes; see FIG. 2); and

wherein drainage channel 3 is positioned relative to intake channels 2 so as to induce water flow through the reaction bed from right to left as illustrated, the flow being inherently induced by a pressurized source (i.e., pumps are well known), as evidenced by the upward flow of water through channel 3 and into the reaction bed (FIG. 1).

Schnur is silent as to intake channel 2 being sloped downwardly away from the water intake, such that the flow through the reaction bed is inherently induced by gravity. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the intake channel 2 as such in the apparatus of Schnur, since the substitution of equivalent flow distribution means involves ordinary skill in the art. The equivalency of pressurized flow means to gravity flow means is evidenced by Rau et al. (section [0080]).

Regarding claims 22 and 24, Schnur is silent as to the alkaline liquid comprising granulated limestone of a diameter as determined by a "Sauter mean diameter calculation". In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriately sized limestone for the buffering agent in the alkaline liquid of the apparatus of Schnur, since such use of limestone is well known in the art, as evidenced by Rau et al. Furthermore, the specific diameter of the limestone is not considered to confer patentability to the claim since the precise diameter would have been considered a result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the diameter of the limestone in the system to obtain the desired reaction rate per unit volume of buffering agent, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. (The same comments with respect to Rau et al. above apply; see sections [0073]-[0077]).

Regarding claim 23, although Schnur is silent as to the water fill level in the reaction bed being at a height of approximately two-thirds in comparison to the limestone contained in the

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bed, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate water filling level in the reaction bed in the apparatus of Schnur, as the specific level is not considered to confer patentability to the claim since the precise filling level would have been considered a result effective variable by one having ordinary skill in the art. Accordingly, one having ordinary skill in the art would have routinely optimized the filling level of water in the system to obtain the desired rate of reaction, *In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980), and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 28, 29, 32 and 33, Schnur (see FIG. 5; column 4, line 35 to column 5, line 23) discloses a system comprising:

an alkaline liquid reaction bed arranged in a plurality of spaced apart bed rows (i.e., **29a, 29b,**

29c) having open rows therebetween which are alternately water inlet channels (i.e., **28a, 28b, 28c**) and water outlet channels (i.e., **30a, 30b, 30c**), the water inlet channels **28a, 28b, 28c** being defined by walls (i.e., partitions **25**) having means (i.e., lower openings or “slots” **32a, 32b, 32c**) for conveying water into the bed rows **29a, 29b, 29c** and the water outlet channels **30a, 30b, 30c** being defined by walls (i.e., partitions **27**) having means (i.e., an overflow region; see FIG. 5) for conveying the water out of bed rows **29a, 29b, 29c** and into outlet channels **30a, 30b, 30c**, wherein the water flows from right to left, as illustrated in FIG. 5, from inlet channel **28a, 28b, 28c**, through bed rows **29a, 29b, 29c** and into outlet channels **30a, 30b, 30c**;

means for providing flue gas containing carbon dioxide into the bed rows so that the flue gas

percolates through the alkaline liquid (i.e., a “main flue” or lines **35a, 35b, 35c** connecting to nozzles **33**; FIG. 5); and
a water supply channel means for providing water into the water inlet channels **28a, 28b, 28c** (i.e., not shown in FIG. 5, an equivalent liquid supply line **2**, shown in FIG. 1), and
a water drain channel means for receiving water from the water outlet channels **30a, 30b, 30c** (i.e., not shown in FIG. 5, an equivalent liquid discharge line **3**, shown in FIG. 1).

Although Schnur is silent as to the alkaline liquid comprising a limestone buffering agent, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriately buffering agent for the alkaline liquid in the apparatus of Schnur, since such use of limestone is well known in the art, as evidenced by Rau et al. (The same comments with respect to Rau et al. apply; see sections [0073]-[0077]).

Regarding claim 30, Schnur discloses the means for conveying water out of bed rows **29a, 29b, 29c** comprise a plurality of passages (i.e., the overflow regions) along a length of the walls **27** defining the water outlet channels **30a, 30b, 30c**. Although Schnur is silent as to the wall **27** height (i.e., hence, the height of the passages), it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate height for the passages in the apparatus of Schnur, on the basis of suitability for the intended use, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claim 31, although Schnur is silent as to the water in the water inlet channels **28a, 28b, 28c** being raised to a level of about 50 cm above a liquid level in bed rows **29a, 29b, 29c**, it would have been obvious for one of ordinary skill in the art at the time the invention was

made to select an appropriate relative height between the water level in the inlet channels versus the bed rows in the apparatus of Schnur (i.e., by changing the locations of the openings, wall heights, etc.) since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding claims 34-36, the apparatus of Schnur inherently comprises a means for pumping water from a suitable, pressurized water source, as evidenced by the upward flow of water through channel 3 and into the reaction bed, as shown in FIG. 1. Furthermore, fluid distribution via pumping is well known in the art, as evidenced by Rau et al. (see section [0080]). Schnur is silent as to whether the suitable water source may comprise at least one of a river, lake, ocean, reservoir and condenser cooling water. However, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select at least one of said water sources in the apparatus of Schnur, on the basis of suitability for the intended use, for the reasons as taught by Rau et al. (i.e., "Locating the reactor vessels on or near a large body of water (e.g. river, lake, sea or ocean) would be advantageous because it could... provide a ready source of water for the reactor," section [0126]).

Response to Arguments

5. Applicant's arguments filed January 16, 2004 have been considered but are moot in view of the new ground(s) of rejection, as necessitated by amendment.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

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Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

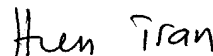
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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
April 20, 2004



HIEN TRAN
PRIMARY EXAMINER